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A Blow to Chemophobia

By Steven F. Hayward

The Centers for Disease Control and Prevention (CDC) has started to conduct annual studies of human exposure to a wide range of environmental chemicals. This effort promises to provide long-term, time-series trend data that in the future will enable policymakers to judge the seriousness of chemical threats to human health. While we need several more years of data to resolve questions about many chemicals, the early results suggest that fears of human exposure to chemicals are exaggerated and unwarranted.

In late January, the Centers for Disease Control released one of the most important government reports you have never heard of—the *Second National Report on Human Exposure to Environmental Chemicals*¹—to modest fanfare and media attention. Ever since Rachel Carson’s *Silent Spring*, chemophobia has been a staple of environmental alarmism, with occasional panics over particular chemicals (e.g., the pesticide Alar in 1989, or the plastic additives known as phthalates in 1997) that often coincide with fundraising drives by the more politicized environmental activist groups.²

For more than two decades the CDC has participated in a health study known as the National Health and Nutritional Examination Survey (known by its acronym NHANES), which was designed to quantify and track health hazards from diet and exposure to the most prominent known environmental health hazards, such as lead. In 1999 the CDC decided to expand the scope of

NHANES to begin tracking a broader range of heavy metals and synthetic chemicals that are widely present in the environment, such as organophosphate pesticides and phthalates. The CDC’s first report in this series was released in March 2001; it covered just twenty-seven chemicals of interest and was limited to a small sample size. The latest report expanded the number of tracked chemicals to 116, along with twelve heavy metals. As this data accumulates over time, health researchers will be able to determine whether human exposure to chemicals is increasing or decreasing.

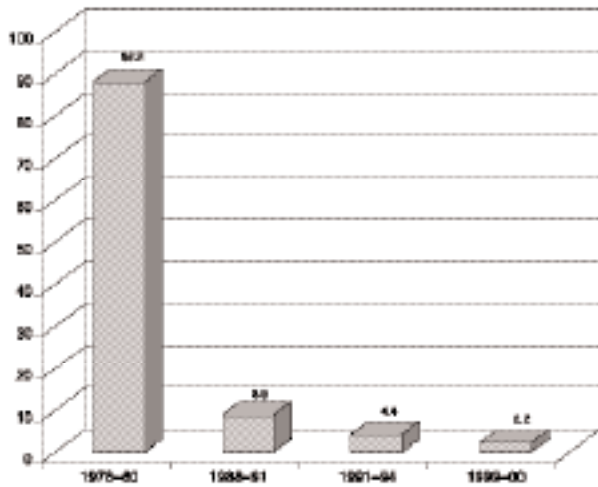
One cannot judge health risk on the basis of the trend data alone. The CDC study determines chemical levels in human blood and urine samples, but its authors hasten to mention that “just because people have an environmental chemical in their blood or urine does not mean that the chemical causes disease.” One reason the CDC has begun tracking these compounds in human tissue and fluids is that our analytical methods are now advanced enough to allow us to detect extremely small traces of these chemicals.

No Heavy Metal Madness

The result from the first two years of this effort suggests that the amounts of toxic chemicals in humans are stable or declining. In the case of lead we now have more than twenty years of data, which show a major decline. In the late 1970s, 88 percent of children aged one to five had blood lead levels above the threshold where harm to cognitive development is feared; in the latest data, only 2.2 percent of young children

Steven F. Hayward is the F. K. Weyerhaeuser Fellow at AEI and the author of the annual *Index of Leading Environmental Indicators*, released each year on Earth Day.

Figure 1: Percentage of Children Aged 1–5 with Blood Lead Levels above 10 Micrograms per Deciliter (µg/dl)



(Source: CDC)

exceed the threshold following a 50 percent decline in the last ten years. See figure 1.)

For many of the metals and chemicals tracked in the CDC study, there is not yet sufficient medical knowledge to set an unsafe threshold of human exposure. There are, however, health-based exposure standards from the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) for five of the twelve heavy metals tracked in the CDC study. The CDC findings show that levels of five heavy metals (mercury, cadmium, cobalt, uranium, and lead) are far below the threshold of health risk. Figure 2 displays the average exposure level and exposure level at the 90th percentile (i.e., for the 10 percent of people with the highest exposure amounts in the sample) expressed as a fraction of the health risk threshold. (For example, the most stringent health-based threshold for mercury is 59 µg/l for pregnant mothers; the 90th percentile finding of 2.48 µg/l represents only 4.2 percent of the level judged to be a health risk for pregnant women.) Caveat: The *Wall Street Journal* reported on February 20 that a soon-to-be-released EPA study will report “evidence” of rising mercury levels in women of childbearing age. The story gave no details, however, of the data or measurements the EPA study contains.³

For the seven other heavy metals in the report (barium, cesium, molybdenum, platinum, thallium, tungsten, and antimony), average exposure levels and exposure levels at the 90th percentile fell for five of the seven and rose slightly for antimony. Platinum was present at such low levels that it was undetectable.

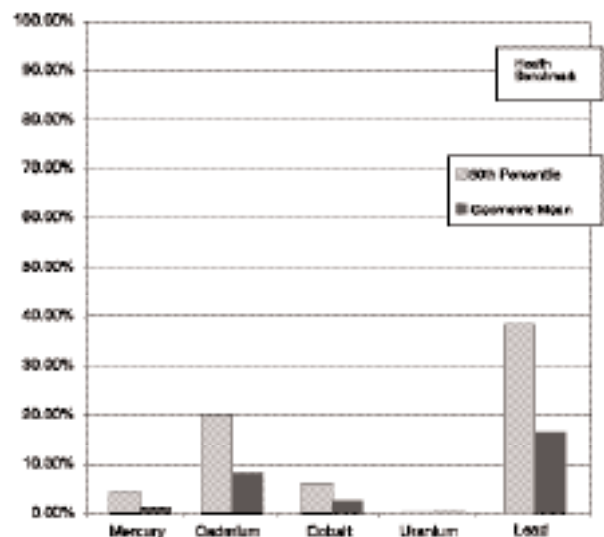
Don’t Palpitate over Phthalates, or Flee over PCBs

The new CDC report contains a second data point for the family of chemicals known as phthalates. There is at present no health-risk threshold for phthalates or even agreement about whether they are potentially harmful to human health. (Phthalates have raised the usual red flags in animal tests, which is why some environmental groups have put these chemicals on their target list.) Of the seven different varieties of phthalate compounds tracked in the CDC study, four are at such low levels in urine samples as to be undetectable. Of the remaining three, two showed slight declines, while only one (monoethyl phthalate) showed an increase.

The CDC study also screened for forty different polychlorinated biphenyl (PCB) and dioxin compounds, finding in almost every case that levels in human samples were below the level of detection. In a few cases a detectable amount showed up at the 90th percentile (the 10 percent of the sample with the highest levels), but future data points will be necessary to show whether there is cause to believe human exposure is increasing.⁴

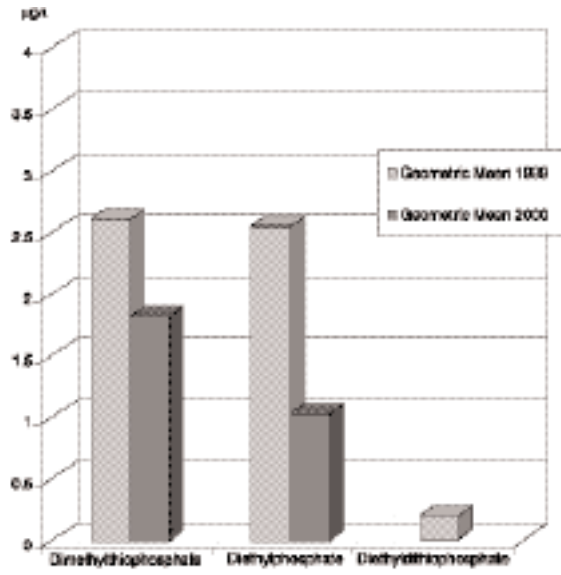
The first CDC study screened for only six organophosphate pesticides, of which only three were found in detectable levels in the entire sample. The levels fell sharply for all three in the new study; for one of them

Figure 2: Heavy Metal Exposures as a Percent of Health-Based Benchmark



(Source: CDC)

Figure 3: Levels of Organophosphate Pesticides in Human Urine



(Source: CDC)

the level had become undetectable. (See figure 3.) The new study expanded its scope to include twenty-five more organochlorine pesticides, and twelve other herbicides and pesticides, including DEET, the mosquito repellent popular with people who engage in outdoor activities. DEET turned out to be undetectable in humans at any level, because the body quickly and fully processes and expels DEET. Good news for barbecue season. As with phthalates, no health standards are available yet for many organophosphate pesticides, though testing is underway to determine if a health threshold is warranted.

A substance that is known to last long in human tissue is hexachlorobenzene (HCB), which was banned in the United States in 1984 because of its proven toxic effects in humans. Although HCB can last in human fatty tissues up to fifteen years, the CDC study found no detectable levels of HCB.

The CDC screening still detects DDT—another long-lasting organochlorine—but notes that the level in humans is about one-fifteenth the level it was in 1976. Likewise, the study finds that the level of cotinine (a metabolite of nicotine, and therefore a marker for second-hand tobacco smoke) in children's blood has fallen 75 percent over the last decade. Whether second-hand tobacco smoke is a genuine health hazard is hotly debated, but the data are nonetheless useful because they show the resilience of the human body.

While dozens of categories of synthetic chemicals worthy of study are not yet included in the CDC study—including a few such as polybrominated diphenyl ethers (PBDEs) that show some signs of being persistent, bioaccumulative toxics—the CDC effort to study human chemical exposures closely will help dispel public chemophobia.

Notes

1. The complete 257-page report can be downloaded from the CDC's website, www.cdc.gov/exposurereport/.
2. Alar was a preservative used on mostly on apples. Phthalates are a compound common in soft plastic products, including baby pacifiers, as well as in consumer products such as shampoo and nail polish; some environmental groups have attacked them as a possible carcinogen.
3. For more background on mercury as an environmental and human health threat, see Randall Lutter and Elisabeth Irwin, "Mercury in the Environment: A Volatile Problem," *Environment*, November 2002, pp. 24–40, available at http://aei.brookings.org/admin/pdffiles/related_02_14.pdf.
4. In its report, the CDC is quick to point out that even in the few cases where detectable amounts of PCBs were found, "finding a measurable amount of one or more PCBs in the blood does not indicate that the levels of the PCBs cause adverse human health" (p. 119).